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[04] Conventional permanent magnet brushless DC motors include a permanent magnet rotor magnetically coupled to a stator, which includes ~~at least one~~ a stator winding electrically coupled to a power supply. In a brushless DC motor, the stator winding has turns distributed substantially along the entire circumference of the motor. As is known in the art, ~~increasing the number of~~ dividing the stator ~~windings~~ winding into a plurality of independently driven phases has the effect of smoothing the output torque of the motor. Typically, three ~~independently driven stator windings, or~~ phases~~,~~ are utilized, as a compromise between smooth output torque and efficient design of the power supply and phase driver circuits. Each phase is manufactured having an equal number turns, which is selected based on desired performance characteristics (output speed vs. torque speed) of the motor. As a result, a motor will operate efficiently only within a predetermined range of speed and torque, which is fixed at the time of manufacture of the motor.

[08] Accordingly, an aspect of the present invention provides a stator winding for a brushless DC motor. The stator winding includes one or more phases, each of which comprises at least two segments having a respective plurality of turns. Each phase segment includes a respective tap adapted to enable electrical connection of the segment to a power supply.

[09] The number of turns of each phase segment may be selected based on a desired performance characteristic of the motor.

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[10] The segments of each phase may be electrically connected in series. Preferably, means are provided for electrically connecting a selected one of the taps to the power supply. Thus a stator current can be controlled to flow through a selected one or more of the segments of each phase, by connecting a selected one of the taps to the power supply. In such cases, the number of turns of each series connected segment may be selected such that a total number of turns in which the stator current is flowing yields ~~a~~ desired performance characteristics of the motor in a selected speed range.

[11] Thus the present invention provides a stator winding having one or more phases, each of which is divided into a plurality of segments such that the stator current can be controlled to flow within a selected portion of ~~the stator~~ each phase of the winding. The number of "active" turns of ~~the stator winding~~ each phase (that is, the number of turns in which stator current is flowing) determines the motor performance, and thus the speed range over which the motor will operate efficiently. The overall speed range of the motor can thus be extended by selectively connecting a power supply across one or more segments to thereby dynamically adjust the number of "active" turns of ~~the stator winding~~ each phase. A permanent magnet brushless DC motor incorporating the stator winding of the present invention can be designed having an overall performance characteristic that is similar to that of a series polar direct current motor. It has a high torque at low speeds, providing good starting and climbing performance of a vehicle incorporating such a motor. Additionally, the motor can operate efficiently at moderate and high speeds.

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Finally, the motor can be controlled using a simple control system, thereby enabling simplified operation of an electric vehicle incorporating the motor.

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I CLAIM:

1. [AMENDED] A stator winding for a brushless DC motor, the stator winding comprising at least one phase, each phase being divided into at least two segments, each segment having a respective plurality of turns, ~~each segment~~ and including a respective tap adapted to enable electrical connection of the segment to a power supply.

2. A stator winding as claimed in claim 1, wherein the number of turns of each segment is selected based on a desired performance of the motor.

3. A stator winding as claimed in claim 1, wherein the segments are electrically connected in series.

4. A stator winding as claimed in claim 3, further comprising means for electrically connecting a selected one of the taps to the power supply, such that a stator current flows through a corresponding selected one or more of the segments.

5. A stator winding as claimed in claim 1, wherein the segments are electrically connected in parallel.

6. A stator winding as claimed in claim 5, further comprising means for electrically connecting a selected one or more of the taps to the power supply, such that a stator current flows through a corresponding selected one or more of the segments.

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7. [CANCELLED] ~~A stator winding as claimed in claim 4 or 6, wherein the number of turns of each segment is selected such that a total number of active turns yields a desired performance of the motor.~~